



Social Network Dynamics among Farmers Vis-à-Vis Knowledge Transfer about Rythu Bharosa Kendras (RBKs) Services

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ABSTRACT

Background: Social networks critically shape agricultural practices and information dissemination in rural communities. In India, the Rythu Bharosa Kendras (RBKs) aim to enhance agricultural support by providing essential services at the village level. However, variations in farmers' knowledge and utilization of RBK services often reflect differences in social network dynamics. This study explores how social network structures influence the dissemination of RBK information among farmers, addressing a gap in the literature. By identifying knowledge sources, mapping social networks and comparing network structures, the study aims to improve the effectiveness of RBKs and support agricultural development.

Methods: The study, conducted during 2020-2023, employed an exploratory approach to assess social network structures among farmers regarding the transfer of knowledge about Rythu Bharosa Kendras (RBKs) services. A multi-stage sampling method was used: East Godavari district and four mandals were purposively selected, followed by random sampling of three villages per mandal and ten farmers per village, resulting in 120 respondents. Data collection involved structured interviews and focus group discussions to identify and classify sources of knowledge about RBK services. Social Network Analysis (SNA) was employed using UCINET and Netdraw to map and analyze these knowledge networks.

Result: The study revealed that local interpersonal sources, such as village secretaries and agro-input dealers and technical staff of RBKs are primary knowledge sources for farmers regarding RBK services. High-knowledge farmers exhibit denser and more extensive social networks across all categories of knowledge sources. Technical staff of RBKs and online platforms are notably influential for high-knowledge respondents. Conversely, Assistant Directors and Joint Directors of Agriculture are least utilized.

Key words: Farmers' knowledge sources, Rythu bharosa kendras (Rbks), Social network analysis, Social network structures.

INTRODUCTION

Social structures among farmers play a critical role in shaping agricultural practices and the dissemination of information within rural communities. These structures, which encompass various forms of social networks, significantly impact how knowledge and resources are shared among farmers (Mashavave *et al.*, 2013; Thuo *et al.*, 2013). In many rural areas, farmers rely on their social connections including fellow farmers, local leaders and extension workers as primary sources of information (Nyambo and Ligete, 2013; Sukhna *et al.*, 2022; Rana *et al.*, 2023) about farming techniques, market opportunities and support services (Effiong *et al.*, 2023). The dynamics of these social networks can greatly influence the effectiveness of information transfer (Fritsch and Kauffeld-Monz, 2008) and, consequently, the adoption of agricultural innovations and practices (Yamini *et al.*, 2024; Weyori *et al.*, 2017; Matuschke and Qaim, 2009). In India, the Rythu Bharosa Kendras (RBKs) represent a key initiative by the Government of Andhra Pradesh aimed at enhancing the agricultural support system. Established as part of a comprehensive strategy to improve farmer welfare and productivity, RBKs are designed to provide a range of essential services at village level itself (Saifuddin *et al.*, 2024). In fact, the RBK concept, recognized by the Centre for the UN Award, has been praised for its transformative impact on agriculture, effectively meeting farmers' needs

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from seed to sale (Anuhya *et al.*, 2022). Services include access to subsidized inputs, e-crop booking, technical advice services, knowledge centre, interactions with scientists via video conferencing, training programs on latest agricultural technologies, weather-related information and market linkage through procurement (Saifuddin *et al.*, 2024). Despite the availability of these services, there is a notable variation in how well farmers are informed and how effectively they utilize the resources provided by RBKs.

This variation often reflects differences in the reach and impact of information dissemination channels. The role of social networks in this context is pivotal. Farmers' knowledge about RBK services and their ability to make use of these services are heavily influenced by their social interactions. Social network theory suggests that information flows through connections between individuals, with some nodes (or individuals) serving as critical points for information dissemination (Spielman *et al.*, 2011). For instance, farmers who are well-connected within their community or who have strong relationships with extension workers are likely to receive and spread information about RBK services more effectively than those who are less connected. Despite an extensive review of the literature, no studies were found specifically addressing the social network dynamics and their influence on knowledge transfer regarding RBK services. Thus, understanding the structure and dynamics of these social networks can provide valuable insights into how knowledge about RBK services is transferred among farmers.

The rationale for this study emerges from the need to understand the interaction between social network dynamics and the dissemination of information about RBK services. By investigating how different types of social connections influence farmers' knowledge and utilization of RBK services, the study aims to uncover key factors that contribute to the effectiveness or limitations of these support centers. Identifying these dynamics is essential for developing targeted strategies to improve the outreach and impact of RBKs, ensuring that their benefits are more widely and equitably distributed. The objectives of this study are threefold: (1) to identify and classify the sources of knowledge transfer regarding RBK services among farmers in the study area, (2) to map the social networks of farmers in relation to their knowledge of RBK services and (3) to compare the network structures of farmers with varying levels of knowledge and identify the influential actors/factors within these networks that affect knowledge transfer. By achieving these objectives, the study seeks to provide a comprehensive understanding of how social networks impact the dissemination and utilization of RBK services. The insights gained from this research are expected to inform the design of more effective communication and outreach strategies, ultimately enhancing the overall impact of RBKs and supporting the broader goals of agricultural development and farmer welfare.

MATERIALS AND METHODS

The study was conducted during the 2020–2023 period at Acharya N.G. Ranga Agricultural University, Agricultural college, Bapatla, Andhra Pradesh, utilizing an exploratory research approach. Andhra Pradesh was purposively selected for this study due to the implementation of the Rythu Bharosa Kendras (RBKs), an innovative initiative by the state government aimed at providing agricultural support directly at farmers' doorsteps. The RBKs were

established on May 30, 2020, with a total of 10,641 centers set up across all village secretariats in the state (Saifuddin *et al.*, 2023). A multi-stage sampling method was employed to gather data. In the first stage, East Godavari district was purposively selected from thirteen districts due to its high number of RBKs relative to other districts. In the second stage, four mandals within East Godavari were selected purposively based on the coverage of RBKs. In the third stage, three villages were chosen from each selected mandal using a simple random sampling procedure. Finally, in the fourth stage, ten farmers from each village were selected using random sampling. This resulted in a total sample of 120 farmers. Prior to data collection, it was verified that RBKs were operational in all selected locations.

Prior to gather data, interviews and focus group discussions were conducted with farmers. A comprehensive list of sources of knowledge transfer regarding RBK services among farmers were compiled and classified. A structured interview schedule was then developed and administered to the respondents. The schedule included questions aimed at identifying the most important knowledge sources for acquiring RBK services, as well as the frequency of discussions with these sources and the utilization of sources. Respondents were required to choose from a prepared list of knowledge sources. It was ensured that all respondents had utilized at least two RBK services at the time of data collection to confirm their frequent engagement with RBK services and receipt of updated information.

Social Network Analysis (SNA) was employed to map and analyze the networks of knowledge sources regarding the knowledge transfer of RBK services. Network maps were created to visualize the relationships between various information actors. To better understand the operational information network, bimodal networks representing diverse information sources were constructed. UCINET, an open-source software, was used for network mapping and calculating network measures such as Degree, Betweenness, Closeness Centrality and Density. Binary relations between network members were entered into UCINET and visualized with Netdraw. In this study, binary relationships between entities were represented as affiliation networks, with data entered as a rectangular matrix where rows and columns represented different sets of entities, including people, events, groups, or organizations. This methodology follows the approach outlined by Vishnu *et al.*, (2019), where affiliation networks correspond to individual farmers' varied sources of information.

RESULTS AND DISCUSSION

Classification of farmers' knowledge sources on RBK services

Based on focus group discussions and interviews with farmers in the study area, knowledge sources related to RBK (Rythu Bharosa Kendras) services were identified and categorized into three distinct types, this categorization

aligned with the findings of Adolwa *et al.*, (2012). These are summarized in Table 1. Local interpersonal sources refer to information channels that involve direct, personal interactions within the farmers' immediate social environment. These included friends or neighbouring farmers, relatives engaged in farming, progressive farmers recognized for their advanced practices, the village secretary who may facilitate information dissemination and agro-input dealers who provide both products and advice. Cosmopolite interpersonal sources encompass knowledge obtained through personal interactions with individuals from different or more distant geographic locations. This category included technical staff of RBK (Village Agricultural Assistants/ Village Animal Husbandry Assistant), Agricultural Extension Officers (AEOs), Mandal Agricultural Officers (MAOs), Assistant Directors of Agriculture (ADAs), Joint Directors of Agriculture (JDAs), scientists from institutions such as ANGRAU (Acharya N.G. Ranga Agricultural University), DAATTC (District Agricultural Advisory and Transfer of Technology Centres) and KVK (Krishi Vigyan Kendras) and field technicians from private

agro-companies. Cosmopolite impersonal sources involved indirect forms of communication that are not based on personal interaction. These sources included publications such as magazines and journals, newspapers, radio broadcasts, television programs, online platforms like WhatsApp and social media and Short Message Service (SMS) for disseminating concise information and updates.

Analysis of the data presented in Table 2 indicated that local interpersonal sources, including relatives, progressive farmers and village secretaries, are critical for farmers with low levels of RBK knowledge. A similar trend was also observed by another researcher in a different context (Vishnu *et al.*, 2019). These sources exhibited high degree centrality, suggesting their significant role in the immediate social networks of low-knowledge farmers. For high-knowledge farmers, cosmopolite interpersonal sources, such as technical staff of RBKs and agricultural extension officers, play a more prominent role, these findings were consistent with the findings of Saifuddin *et al.*, (2022); Saifuddin *et al.*, (2024) and Saifuddin *et al.*, (2024). This shift indicated that as farmers' knowledge

Table 1: Identification and classification of sources of knowledge about RBK services among farmers in the study area.

Categorization of knowledge sources	Farmers' Knowledge sources of RBK services	Points of concern
Local Interpersonal	Friends/neighbouring, Family members/relative farmers, Progressive farmers, Relative farmers/Family members, Village secretary, Agro- input dealers	Nature of information shared, Regularity of interaction, Flow of information
Cosmopolite Interpersonal	Technical staff of RBK, Agricultural Extension Officer (AEO), Mandal Agricultural Officer (MAO), Assistant Director of Agriculture (ADA), Joint Director of Agriculture (JDA), ANGRAU/ DAATTC/KVK scientists, Field technician of private companies.	Nature of information shared, Regularity of interaction, Flow of information
Cosmopolite Impersonal	Publications, Newspaper, Radio, Television, online platforms, SMS	Nature of information, Frequency of utilization

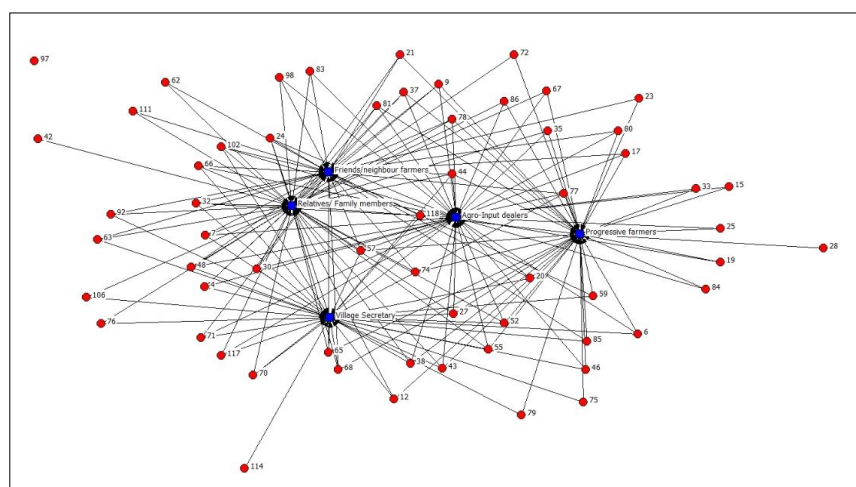


Fig 1: Social network diagram showing local interpersonal knowledge sources for respondents with low knowledge of RBK services (Density = 0.567, No. of ties = 136).

increases, they rely more on formal, external sources of information. The study also highlighted that online platforms and newspapers are crucial for disseminating information about RBK services. Online platforms, with their high degree and closeness centrality for high-knowledge respondents, demonstrate their effectiveness in reaching and engaging well-informed farmers. In contrast, newspapers hold a central role for low-knowledge farmers, reflecting their ongoing importance in rural information dissemination despite the rise of digital media. In contrast, the Assistant Director of Agriculture (ADA) and the Joint Director of Agriculture (JDA) were identified as the least utilized sources of information regarding RBK services among the farmers in the study area. This suggested a preference for more immediate and locally accessible sources of knowledge over higher-level administrative and technical contacts.

Mapping of social networks of farmers in relation to their knowledge of RBK services

Farmers' knowledge of RBK (Rythu Bharosa Kendras) services was classified into two levels: low and high. The study mapped the social networks of farmers in relation to their knowledge of RBK services across all three categories of knowledge sources. This mapping examined how farmers' interactions with various types of information sources influence their level of knowledge of RBK services.

A comparison of Fig 1 and Fig 2 revealed that the network density and the number of connections among high-knowledge farmers regarding RBK services are greater than those among low-knowledge respondents within the locale interpersonal sources. Network density is the proportion of actual connections between nodes compared to the total number of possible connections among all pairs of nodes (Grunspan *et al.*, 2014). This suggested that high-knowledge farmers have more extensive and densely connected networks of local

interpersonal sources compared to their low-knowledge counterparts.

Fig 3 illustrated the social network of cosmopolite interpersonal knowledge sources for respondents with low knowledge of RBK services, characterized by a density of 0.358 and a total of 172 ties. In contrast, Fig 4 depicted the social network of cosmopolite interpersonal knowledge sources for respondents with high knowledge of RBK services, with a density of 0.375 and 180 ties. These figures

Table 2: Distribution of knowledge sources on RBK services within the farmers' information networks. (n =120)

Knowledge sources	Frequency (%)
a. Local interpersonal	
Friends/neighbouring farmers	68 (56.66)
Progressive farmers	67 (55.83)
Relatives/Family members	72 (60.00)
Village secretary	75 (62.50)
Agro-input dealers	73 (60.83)
b. Cosmopolite interpersonal	
Technical staff of RBK (VAA/VAHA)	76 (63.33)
Agricultural Extension Officer (AEO)	56 (46.66)
Mandal Agricultural Officer (MAO)	33 (27.50)
Assistant Director of Agriculture (ADA)	22 (18.33)
Joint Director of Agriculture (JDA)	17 (14.16)
ANGRAU/DAATTC/KVK scientists	51 (42.50)
Field technician of private Agro- companies	57 (47.50)
NGO's	40(33.33)
c. Cosmopolite impersonal	
Publications	42 (35.00)
Newspaper	76 (63.33)
Radio	37 (30.83)
Television	70 (58.33)
Online platforms	64 (53.33)
SMS	42 (35.00)

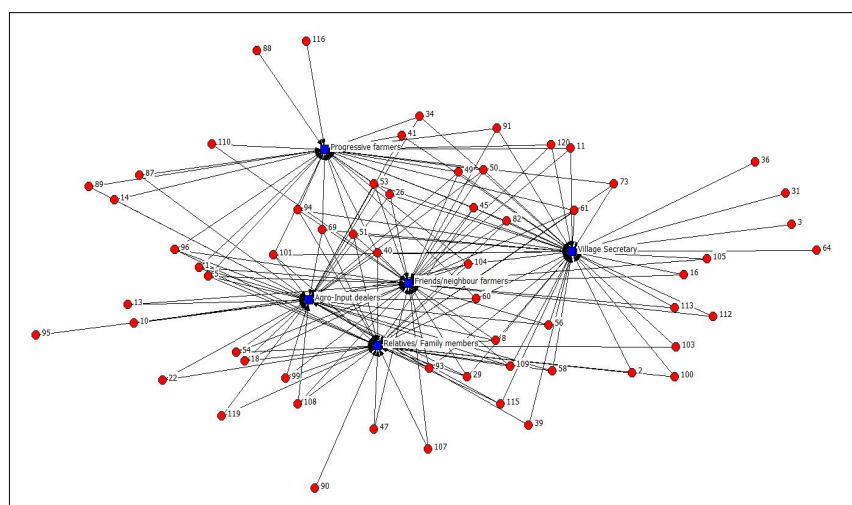


Fig 2: Social network diagram showing local interpersonal knowledge sources for respondents with high knowledge of RBK services (Density = 0 .617, No. of ties = 170).

indicated that while both groups have relatively similar network structures, the network associated with high-knowledge respondents is slightly denser and includes a greater number of ties. This suggested that respondents with higher knowledge of RBK services had more interconnected and extensive cosmopolite interpersonal networks compared to those with lower knowledge.

The analysis of Fig 5 and 6 highlighted that notable differences in the cosmopolite impersonal knowledge networks between respondents with low and high knowledge of RBK services. Fig 5 depicted the network for respondents with low knowledge, which has a density of 0.406 and includes 146 ties. In contrast, Fig 6 showed the network for respondents with high knowledge, featuring a higher density of 0.514 and 185 ties. These findings indicated that respondents with high knowledge of RBK services are associated with a more densely connected

network of cosmopolite impersonal knowledge sources. The increased density and number of ties in the high-knowledge group suggest a greater engagement with and exposure to a diverse range of impersonal information sources. This enhanced connectivity likely facilitates a more comprehensive understanding of RBK services among individuals with higher levels of knowledge.

Comparing network structures and key influencers in knowledge transfer among farmers with different RBK service knowledge levels

The analysis of Table 3 indicated that several notable patterns in the normalized centrality measures for local interpersonal sources used by respondents with varying levels of knowledge about RBK services. Degree centrality measures the number of direct information connections an actor has within a network (Matous and Todo, 2015).

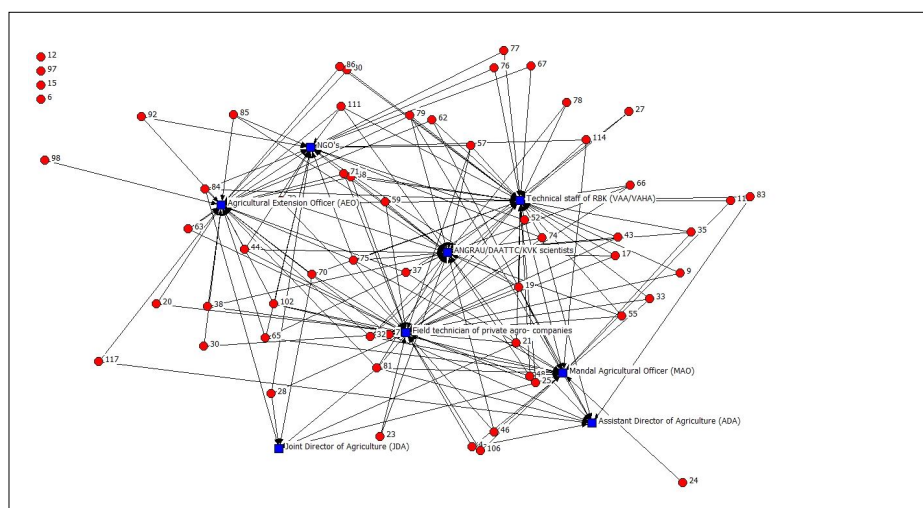


Fig 3: Social network diagram showing cosmopolite interpersonal knowledge sources for respondents with low knowledge of RBK services (Density = 0.358, No. of ties = 172).

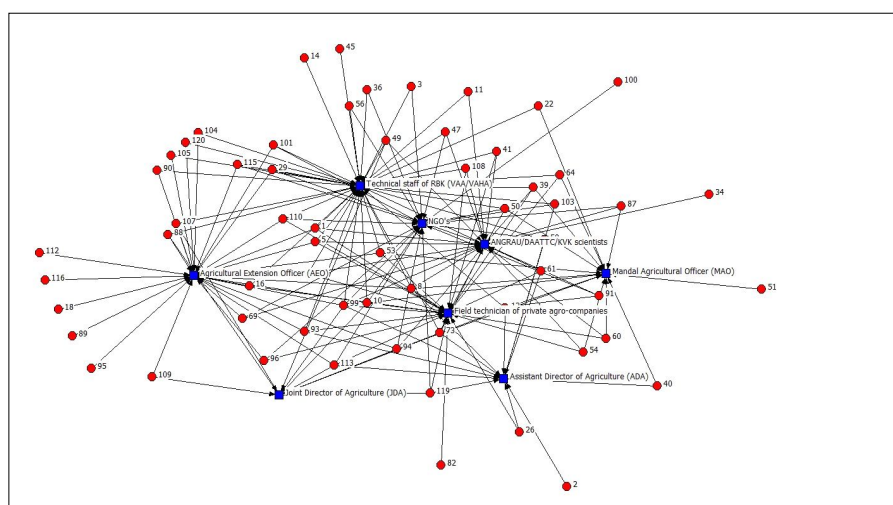


Fig 4: Social network diagram showing cosmopolite interpersonal knowledge sources for respondents with high knowledge of RBK services (Density = 0.375, No. of ties = 180).

For respondents with low knowledge, relatives or family members have the highest degree centrality (0.667), indicating their prominent role in the network. In contrast, for those with high knowledge, the village secretary had highest degree centrality (0.650), suggesting a key role in connecting high-knowledge individuals within the network.

An actor with high closeness centrality will have close connections with many others, positioning them well to access information or resources from across the network (Spielman *et al.*, 2011). In terms of closeness centrality, relatives or family members exhibited the highest measure for respondents with low knowledge (0.618), implied that

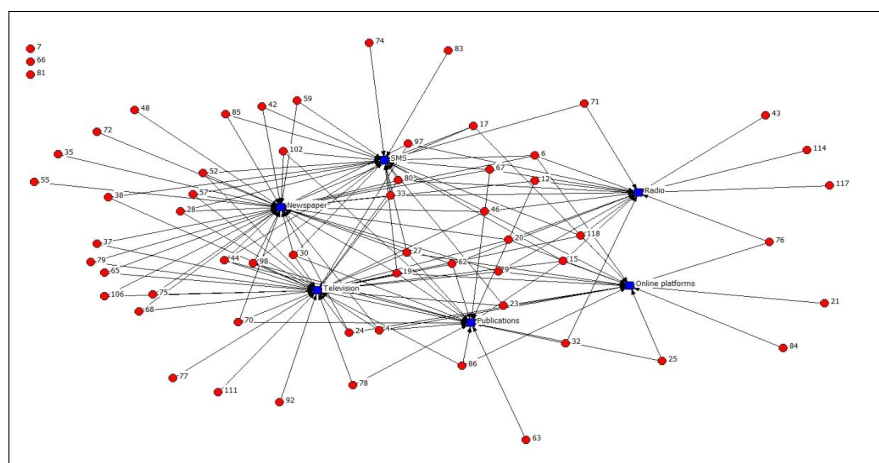


Fig 5: Social network diagram showing cosmopolite impersonal knowledge sources for respondents with low knowledge of RBK services (Density = 0.406, No. of ties = 146).

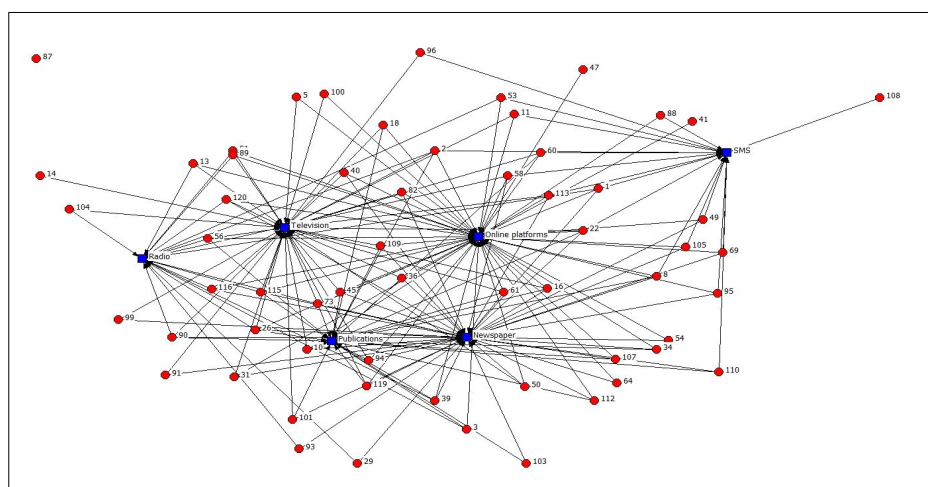


Fig 6: Social network diagram showing cosmopolite impersonal knowledge sources for respondents with high knowledge of RBK services (Density = 0.514, No. of ties = 185).

Table 3: Normalized centrality measures of local interpersonal sources for respondents with varying levels of knowledge about RBK services. (n =120)

Local Interpersonal	Centrality measures					
	Degree centrality		Closeness centrality		Betweenness centrality	
	Low knowledge	High knowledge	Low knowledge	High knowledge	Low knowledge	High knowledge
Friends/neighbouring farmers	0.633	0.533	0.548	0.576	0.133	0.199
Progressive farmers	0.612	0.583	0.596	0.556	0.230	0.162
Relatives/Family members	0.667	0.489	0.618	0.548	0.225	0.178
Village secretary	0.539	0.650	0.576	0.576	0.182	0.307
Agro-input dealers	0.550	0.623	0.596	0.618	0.190	0.219

they were more accessible in the network. For high-knowledge respondents, agro-input dealers show the highest closeness centrality (0.618), indicating their effective positioning to provide information. Regarding betweenness centrality, the village secretary has the highest score for respondents with high knowledge (0.307), highlighting their significant role in bridging connections between different parts of the network. For those with low knowledge, progressive farmers have the highest betweenness centrality (0.230), reflecting their intermediary role in linking various network members (Msaddak *et al.*, 2017).

The findings from Table 4 provide insights into the centrality measures of cosmopolite interpersonal sources for respondents with different levels of RBK services knowledge. The Technical Staff of RBK (VAA/VAHA) emerged as the most central source, showing the highest degree centrality for both low (0.633) and high knowledge (0.678) respondents, underscoring their pivotal role within the network. In contrast, the Joint Director of Agriculture (JDA) consistently ranks lowest in degree centrality (0.100 for low knowledge and 0.183 for high knowledge), indicating a less significant position. For closeness centrality, the Agricultural Extension Officer (AEO) ranked highest among low-knowledge respondents (0.500), suggesting greater accessibility within the network. Meanwhile, the Technical Staff of RBK (VAA/VAHA) had highest closeness centrality

for high-knowledge respondents (0.627), reflecting their effectiveness in information dissemination. In terms of betweenness centrality, the Technical Staff of RBK (VAA/VAHA) also leads for both low (0.273) and high knowledge respondents (0.356), highlighting their essential role in connecting various network segments. On the other hand, the JDA and ADA had lowest betweenness centrality scores, indicating a more marginal role in bridging network connections.

Table 5 detailed the normalized centrality measures for cosmopolite impersonal sources among respondents with different levels of RBK services knowledge. For those with high knowledge, online platforms exhibited the highest degree centrality (0.783), signifying their key position in the information network. Conversely, for respondents with low knowledge, the newspaper holds the highest degree centrality (0.600), reflecting its central role. Publications had lowest degree centrality for high-knowledge respondents (0.433), while SMS ranked lowest for low-knowledge respondents (0.417). Regarding closeness centrality, the newspaper ranked highest for low-knowledge respondents (0.565), indicating its effective reach. Among high-knowledge respondents, online platforms showed the highest closeness centrality (0.714), demonstrating their role in providing readily accessible information. Publications exhibited the lowest closeness centrality for high-knowledge

Table 4: Normalized centrality measures of cosmopolite interpersonal sources for respondents with varying levels of knowledge about RBK services. (n = 120)

Cosmopolite Interpersonal	Centrality measures					
	Degree centrality		Closeness centrality		Betweenness centrality	
	Low knowledge	High knowledge	Low knowledge	High knowledge	Low knowledge	High knowledge
Technical staff of RBK (VAA/VAHA)	0.633	0.678	0.587	0.627	0.273	0.356
Agricultural Extension Officer (AEO)	0.483	0.483	0.500	0.544	0.156	0.255
Mandal Agricultural Officer (MAO)	0.317	0.233	0.451	0.446	0.081	0.074
Assistant Director of Agriculture (ADA)	0.150	0.217	0.402	0.440	0.016	0.067
Joint Director of Agriculture (JDA)	0.100	0.183	0.389	0.430	0.005	0.026
ANGRAU/DAATTC/KVK scientists	0.333	0.367	0.457	0.493	0.123	0.119
Field technician of private Agro- companies	0.450	0.333	0.514	0.481	0.071	0.109
NGO's	0.533	0.417	0.536	0.514	0.185	0.150

Table 5: Normalized centrality measures of cosmopolite impersonal sources for respondents with varying levels of knowledge about RBK services. (n = 120)

Cosmopolite impersonal	Centrality measures					
	Degree centrality		Closeness centrality		Betweenness centrality	
	Low knowledge	High knowledge	Low knowledge	High knowledge	Low knowledge	High knowledge
Publications	0.267	0.433	0.427	0.500	0.075	0.074
Newspaper	0.600	0.667	0.565	0.625	0.312	0.235
Radio	0.300	0.317	0.483	0.455	0.134	0.052
Television	0.567	0.600	0.547	0.583	0.279	0.200
Online platforms	0.283	0.783	0.432	0.714	0.109	0.349
SMS	0.417	0.283	0.479	0.443	0.160	0.065

respondents (0.500), while radio had lowest for low-knowledge respondents (0.483). In terms of betweenness centrality, online platforms were the most significant for high-knowledge respondents (0.349), highlighting their crucial role in linking different parts of the network. The newspaper holds the highest betweenness centrality for low-knowledge respondents (0.312), underscored its role in connecting various network segments. Radio and SMS showed the lowest betweenness centrality for the high- and low-knowledge groups, respectively.

CONCLUSION

This study illuminated the critical role of social networks in shaping farmers' knowledge of Rythu Bharosa Kendras (RBK) services. Key findings revealed that local interpersonal sources, such as relatives and village secretaries, were vital for low-knowledge farmers, while cosmopolite interpersonal sources, notably technical staff of RBKs, were crucial for high-knowledge farmers. Online platforms and newspapers emerged as significant dissemination channels, with online platforms particularly effective for high-knowledge farmers. The higher network density among well-informed farmers underscored their extensive engagement with diverse information sources. These insights suggested that tailored communication strategies, enhancing both local and cosmopolite networks, could improve RBK service outreach. Future research should explore these dynamics in varied contexts to further validate these findings and refine strategies for agricultural support services.

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Disclaimers

The views and conclusions expressed in this article are solely those of the authors and do not necessarily represent the views of their affiliated institutions. The authors are responsible for the accuracy and completeness of the information provided, but do not accept any liability for any direct or indirect losses resulting from the use of this content.

Informed consent

No animals are involved in this research study.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article. No funding or sponsorship influenced the design of the study, data collection, analysis, decision to publish, or preparation of the manuscript.

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